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1007557 17 November 1997 (17.11.97) NL(71) Applicant (for all designated States except US): COSMOCAIR
C.V. [NL/NL]; A. Flemminglaan 1, NL-2613 AX Delft (NL).

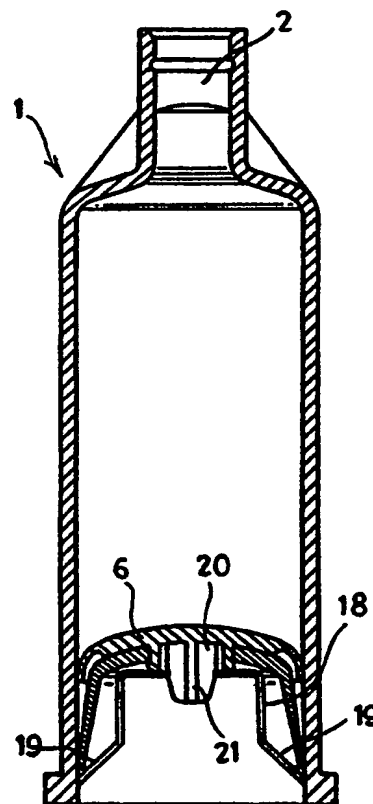
(72) Inventor; and

(75) Inventor/Applicant (for US only): VAN DER HEIJDEN,
Edgar, Ivo, Maria [NL/NL]; Johan Huizingastraet 14,
NL-1827 NA Alkmaar (NL).(74) Agent: BAKKUM, R., J.; Van Exter Polak & Charlouis B.V.,
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(54) Title: CONTAINER WITH VARIABLE VOLUME

(57) Abstract

Container (1) with variable volume having a substantially cylindrical shape, comprising near one end a dispensing aperture (2), and a piston (6) which is freely movable in the container, which piston (6) comprises at least one sealing collar (7, 8) which is slidable along the inside wall of the container and provides a seal, which sealing collars extend near the inside wall of the container (1) in a direction opposite to the intended direction of outflow, the container (1) being intended for filling with a material (4) which can be dispensed by applying a vacuum to the dispensing aperture (2).



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Short title: Container with variable volume

The present invention relates to a container with variable volume having a substantially cylindrical shape, comprising near one end a dispensing aperture, and a piston which is freely movable in the container, which piston
5 comprises at least one sealing collar which is slidable along the inside wall of the container and provides a seal, the container being intended for filling with a material which can be dispensed by applying a partial vacuum to the dispensing aperture.

10 Such a container is known in the prior art, and is used in particular as a so-called auxiliary container in an aerosol which is intended for dispensing multicomponent material. Such an auxiliary container often contains a material which must not come into contact with air, water
15 or the contents of the aerosol, otherwise said contents lose their reactive effect.

In practice, such known containers are filled through the dispensing aperture or the other end of the container. Considerable problems occur in both cases.

20 All these problems are connected with the design of the piston, and in particular the sealing collars used in the process. In the prior art, the piston used always comprises two sealing collars, one sealing collar extending near the inside wall of the container in the intended
25 direction of outflow of the material to be dispensed, while the other sealing collar extends near the inside wall of the container in a direction opposite to the intended direction of outflow.

If such a container is filled with material through
30 the dispensing aperture and the piston is already present in the container, one or more of the following problems occur: material is forced along the piston, the piston or the sealing collars are undesirably deformed, or a considerable air space remains in the container after
35 filling. Moreover, the dispensing aperture, which can be soiled with material after filling, still has to be sealed,

since the containers have to be distributed in a closed state. Any soiling will adversely affect the sealing of the container.

If the container is filled through the dispensing
5 aperture and the piston is not yet present in the container, the piston has to be inserted afterwards, which is virtually impossible, in view of the shape of the sealing collars. For this purpose, it is necessary to use, for example, vacuum, but this is undesirable. Moreover, in this
10 case there is a considerable risk of an air space being enclosed in the container between the piston and the material.

If such a container is filled through the other end, opposite the end with the dispensing aperture, the
15 piston also has to be inserted afterwards. The above problems occur again in this process.

The object of the present invention is to provide a solution to the abovementioned disadvantages of the known containers with variable volume, and to this end the
20 invention is characterized in that all sealing collars extend near the inside wall of the container in a direction opposite to the intended direction of outflow.

According to the invention, the possibility is thus provided for filling the container through the end situated
25 opposite the dispensing aperture and then inserting the piston in a simple manner. The design of the sealing collar will make the piston easy to insert, and all air present in the container will escape along the sealing collar(s). This also rules out the need for the use of vacuum. Furthermore,
30 the dispensing aperture can already be closed prior to filling, by means of a membrane or other removable seal, so that a clean dispensing aperture is always ensured.

The piston advantageously comprises two sealing collars. It is particularly advantageous if one of the
35 sealing collars is made in one piece with the piston, as an assembly, and the other piston is connected to said assembly. This embodiment will be explained further on with reference to the drawing.

The piston preferably comprises a centring means.

In particular in the case of a single sealing collar, it is advisable to use a centring means, for example in the form of a drag anchor. A drag anchor can be a part which is connected to the piston and interacts locally with the inside wall of the container for centring the piston, in order to prevent the latter from tilting (going out of alignment) in the container during movement, and beginning to leak. Such a centring means can be situated at any desired side of the piston, but is preferably situated at the rear side of the piston, viewed in the intended direction of movement during dispensing of material.

In a special embodiment, the piston comprises barbed means which serve to prevent any movement of the piston in a direction opposite to the intended direction of outflow. The barbed means can be designed in the form of, for example, a circumferential collar which is interrupted or otherwise. The material of the barbed means is not particularly limited and can be selected depending on the particular application. It is important here to ensure that the barbed means can be moved in the desired direction of outflow of the material in the container. This can be achieved, for example, by making the barbed means from a flexible or even a soft material and by the barbed means providing the barbed function by the shape thereof. The barbed means are advantageously made of plastic or metal, in particular of steel. The barbed means can also be made largely of plastic, while the barb(s) is (are) made of metal.

The barbed means serve to prevent any movement of the piston opposite to the intended direction of outflow. In other words, in the presence of the barbed means the piston can be moved only in the direction of the dispensing aperture. In the prior art it is known that in the case of containers with variable volume, comprising a cylindrical container and a freely moving piston, the piston can sag out of the container in some cases. Of course, this leads to very undesirable leakage of the material present in the container. This sagging of the piston can occur as a result of creep if the container is made of plastic. It can also

be the result of a partial vacuum possibly occurring on the outside of the container at the end situated opposite the dispensing aperture.

If in the presence of the barbed means the piston
5 becomes inclined to sag out of the container, this will not be possible because of the fact that the barbed means will be pressed against the inside wall of the container by any force opposite to the intended direction of outflow and this rules out any movement of the piston in that
10 direction.

The centring means and the barbed means are advantageously combined in one part.

The inside wall of the container preferably extends in a very slightly conical shape in the direction of the
15 dispensing aperture. This means that, in particular in the case of containers and pistons made of plastic, any adverse consequence of creep occurring in plastic as time passes is avoided. Whenever the container has not been used for quite a long time and creep could possibly have occurred in the
20 plastic, at the time of the next use the piston will be moved to a position where the inside wall of the container has a smaller diameter. This ensures that there is always sufficient pre-tension between the sealing collars of the piston and the inside wall of the container.

25 Very slightly conical advantageously means that the diameter of the inside wall of the container decreases by a maximum of 4% over the length of the container.

The invention also provides a container with variable volume, filled with material to be dispensed,
30 which is characterized in that said container is a container according to the invention.

The material which can be accommodated in the containers according to the invention is not particularly limited and depends on the particular application. Examples
35 are multicomponent adhesives (in which the container, for example, contains the reactive component), paints (in which the container, for example, contains a mixing colour), cosmetic products (in which the container, for example, contains a reactive component, such as an enzyme

concentrate) etc. The material can also be a material which has to be diluted with another material from, for example, a larger container. For example, vitamin concentrates can be used in this way.

5 The material which can be accommodated in the container according to the invention will in practice be liquid, but it is not limited thereto. The material could also be selected from solid material, such as granules, powder and the like, paste-type materials or combinations
10 of liquid, solid and paste-type material.

 Finally, the invention provides an aerosol intended for dispensing a multicomponent material, comprising a main container and one or more auxiliary containers, which
15 containers are connected to a dispensing assembly which serves to remove material from the containers and dispense it, characterized in that at least one of the auxiliary
containers is a container according to the invention.

 Such aerosols are used in, for example, the paint industry and the adhesives industry, but also in the field
20 of cosmetics. In the last instance, the aerosol generally comprises a main container with a cosmetic base product, while an auxiliary container contains, for example, an active enzyme concentrate which may be not be mixed with
the base material until the time of dispensing, because the
25 enzyme material loses its activity on contact with water or air.

 The invention will be explained in greater detail below with reference to the appended drawing, in which:

 Fig. 1 shows a section of a container with variable
30 volume according to the invention;

 Fig. 2 shows a section of part of a container with variable volume according to the prior art;

 Fig. 3 shows a section of the container according to the invention, in which the piston comprises barbed
35 means; and

 Fig. 4 (a)-(d) shows bottom views of four embodiments of the barbed means.

 Fig. 1 shows a container 1 according to the invention, which container comprises a dispensing aperture 2

which is sealed by a breakable membrane 3. A material 4 to be dispensed is present in the container. The container preferably has a substantially cylindrical cross-section.

At the end 5 situated opposite the dispensing aperture 2, the container 1 is open and a piston 6 is inserted, which piston is made in one piece with a sealing collar 7, and to which an additional sealing collar 8 is connected. The additional sealing collar 8 comprises a central opening 9 which is snapped over an upstanding edge 10 with a circumferential protuberance 11 on the piston 6. Unlike the container shown in Fig. 2 according to the prior art, the sealing collars 7 and 8 in the case of the container according to the invention extend near the inside wall of the container 1 in a direction opposite to the intended direction of outflow of the material.

As can be seen in Fig. 2, the container 14 according to the prior art comprises a piston 15 with two sealing collars 16 and 17, sealing collar 16 extending in the intended direction of outflow of the material to be dispensed.

It can be seen clearly from the figures that the piston 6 according to the invention can be inserted very much more easily into the container 1 than the piston 14 according to the prior art. The containers according to the prior art in practice must be filled under vacuum, which is, of course, unnecessarily complicated. In the course of this, air can never be excluded completely, which is a problem in particular in the case of liquids of relatively low viscosity, for example $<10,000$ cp.

When the piston 6 according to the invention is being inserted into the container 1 after the latter has been filled with material 4, air can easily move along the edge 12 of the sealing collar 7 and in a similar manner along the sealing collar 8. The space 13 between the two sealing collars serves to absorb a tolerance spread during the filling process; in other words, the accuracy, and thus the costs during filling, can be reduced considerably in the case of the container according to the invention. The presence of the space 13 between the collars makes it

possible always to move the piston 6 over the same distance in the container 1. If a little too much material is introduced into the container, the excess material can be absorbed in this space 13.

5 The container 1, the piston 6 and the sealing collars in practice are made of plastic.

 The process of filling through the open end 5 and subsequently inserting the piston has the advantage that the dispensing aperture 2 can already be sealed, for
10 example by means of a membrane 3 or, for example, by means of a temporary cap or the like.

 The membrane 3 is designed in such a way that it can be broken by mounting the container, for example, on a dispensing assembly of an aerosol, by sliding the
15 dispensing aperture 2 onto a connecting channel or the like.

 The sealing collar 8 has a considerably greater axial length than the sealing collar 7, which serves to ensure good centring of the entire assembly of piston and
20 sealing collars 7 and 8 during use.

 If one sealing collar is used, for example only the sealing collar 7, a so-called drag anchor can be used. A drag anchor could be in the form of the sealing collar 8, which does not rest against the inside wall over the full
25 periphery. In other words, the sealing collar 8 in that case comprises, for example, axial cut-outs. Such a drag anchor could also, instead thereof, be connected at the opposite side, in other words the front side of the piston 6, and serve as a centring means there.

30 Fig. 3 shows an embodiment of the container according to the invention in which the piston 6 comprises barbed means. Said barbed means are designed in the form of a part 18 with barbed projections 19. The part 18 is fixed on a projection 20 provided with axial ribs 21 on the
35 piston 6.

 Fig. 4(a)-(d) shows bottom views of four embodiments of the part 18, with 2, 3, 4 respectively and five barbed projections 19. In the part 18 an aperture 22 is present, which serves for cooperating with the projection

20 on the piston 6.

The part 18 is preferably made of metal and more preferably of steel. The dimensions of the part 18 are not critical provided that these are such that the part is
5 sufficiently strong and flexible to fulfil the intended function thereof. The part 18 can also be made substantially of plastic, whereas the barbed projections 19 are made of metal. It will be clear that many variants of the barbed means are possible.

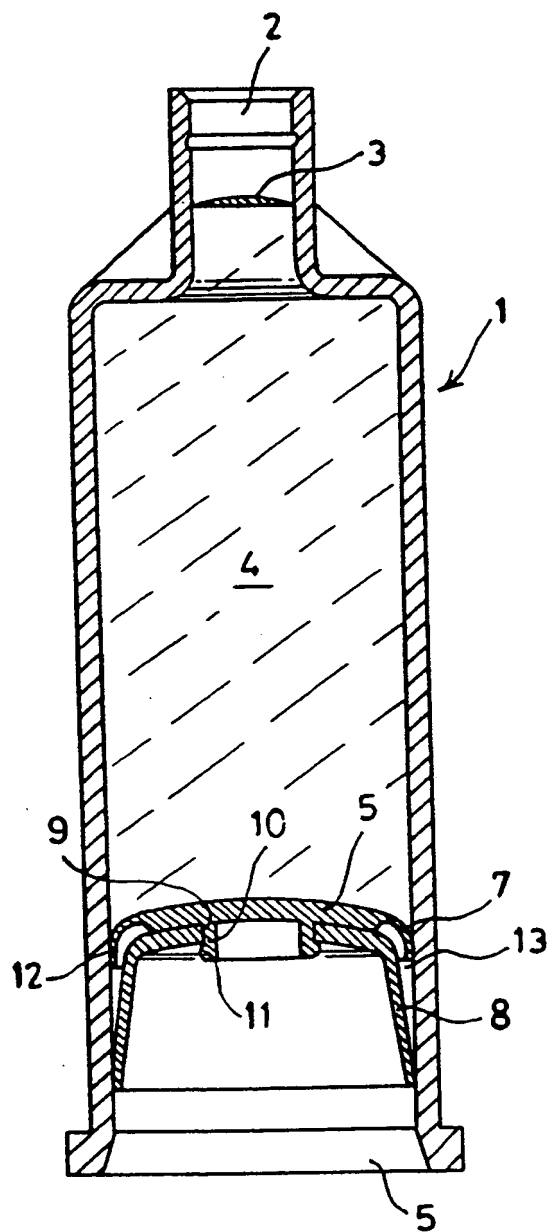
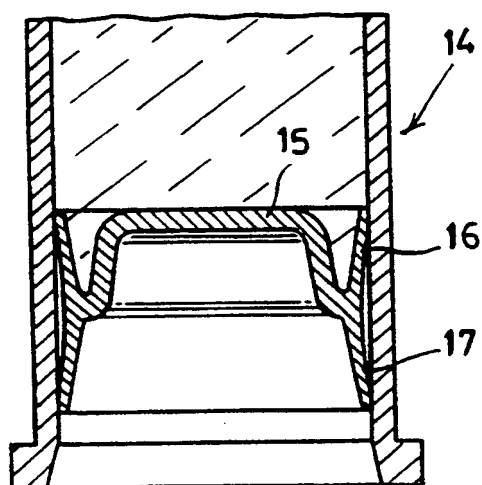
10 In the embodiment of the part 18 shown in Fig. 3, said part can also serve as a centring means. The part 18 can be formed in many other ways.. For instance, it can be a dish with an upstanding collar. The sealing collar 8 can also be made of metal, in order to serve as a barbed means.

Claims

1. Container (1) with variable volume having a substantially cylindrical shape, comprising near one end a dispensing aperture (2), and a piston (6) which is freely movable in the container, which piston (6) comprises at
5 least one sealing collar (7, 8) which is slidable along the inside wall of the container and provides a seal, the container (1) being intended for filling with a material (4) which can be dispensed by applying a partial vacuum to the dispensing aperture (2), characterized in that all
10 sealing collars (7, 8) extend near the inside wall of the container (1) in a direction opposite to the intended direction of outflow.
2. Container according to claim 1, characterized in that the piston comprises two sealing collars (7, 8).
- 15 3. Container according to claim 2, characterized in that one of the sealing collars (7) is made in one piece with the piston (6), as an assembly, and the other piston (8) is connected to said assembly.
4. Container according to one or more of claims 1-3,
20 characterized in that the piston (6) comprises centring means.
5. Container according to one or more of the preceding claims, characterized in that the piston (6) comprises barbed means (18) which serve to prevent any movement of
25 the piston (6) in a direction opposite to the intended direction of outflow.
6. Container according to one or more of the preceding claims, characterized in that the centring means and the barbed means (18) are combined in one part.
- 30 7. Container according to one or more of the preceding claims, characterized in that the inside wall of the container (1) extends in a very slightly conical shape in the direction of the dispensing aperture (2).
8. Container according to claim 7, characterized in
35 that the diameter of the inside wall of the container (1) decreases by a maximum of 4% over the length of the container.

9. Container with variable volume filled with material to be dispensed, characterized in that the container is a container according to one or more of the preceding claims.

10. Aerosol intended for dispensing a multicomponent
5 material, comprising a main container and one or more auxiliary containers, which containers are connected to a dispensing assembly which serves to remove material from the containers and dispense it, characterized in that at least one of the auxiliary containers is a container
10 according to one or more of the preceding claims.

**FIG. 1.****FIG. 2.**

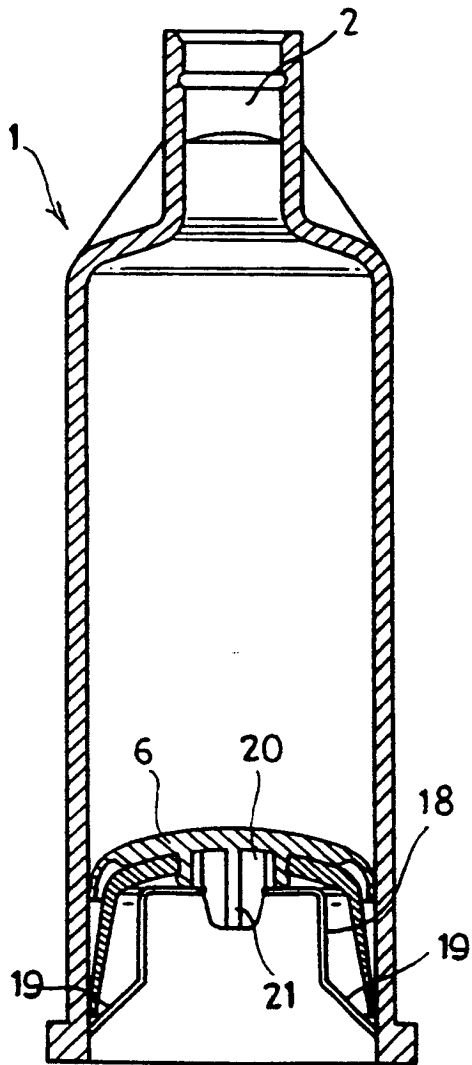


FIG. 3.

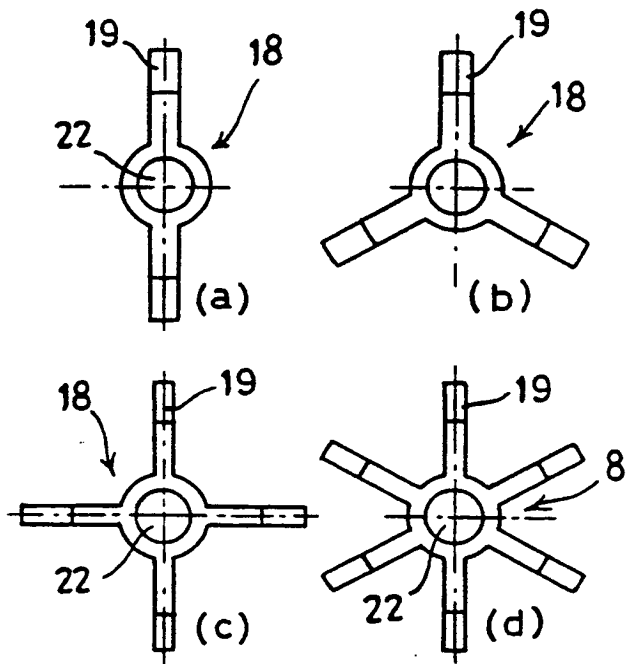


FIG. 4.

INTERNATIONAL SEARCH REPORT

International Application No

PCT/NL 97/00649

A. CLASSIFICATION OF SUBJECT MATTER

IPC 6 B65D83/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 6 B65D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No
X	FR 2 350 278 A (FIRMA JOSEF WISCHERATH KG) 2 December 1977	1,9
A	see page 5-9; figures 1,2 ---	2,4
X	FR 1 070 728 A (GESTETNER LTD) 10 August 1954 see column 1-3; figure 1 ---	1,2,9
A	EP 0 497 739 A (KELLER) 5 August 1992 see page 3, column 23-36; figure 4 ---	1,2,4,9
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A	WO 96 32343 A (SMITHKLINE BEECHAM PLC) 17 October 1996 see page 7, line 23-25; figures 1-8 ---	5,6,9
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☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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Date of the actual completion of the international search

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NL - 2280 HV Rijswijk
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INTERNATIONAL SEARCH REPORT

International Application No

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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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INTERNATIONAL SEARCH REPORT

Information on patent family members

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